It's not just what you say, it's how you say it: Intonation, *yes* and *no**

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1.   Introduction

Recent research has demonstrated that the English polar particles *yes* and *no* are interchangeable in responses to negative *yes/no* questions (YNQs), at least when accompanied by a following sentence conveying the intended interpretation (Cooper & Ginzburg 2011, Roelofsen & Farkas 2015, Holmberg 2012, Kramer & Rawlins 2009, Krifka 2013). Intuitions have also been reported that a special intonational tune is used on positive responses to negative YNQs. Bare polar particle responses have been argued to be most likely interpreted as negative. This paper reports on experiments testing these claims, and it aims to improve our understanding of the special tune involved. In two experiments, we demonstrate the interchangeability of particles in responses to negative YNQs, even if certain readings of bare particles are available only with the help of certain intonations. We show that the contour most commonly used in polar responses when not using the declarative contour is the contradiction contour (CC), and propose an analysis of the contour that can explain the conditions on its use.

2.   Polar particles *yes* and *no*

Recent analyses of polar particles *yes* and *no* include those in terms of syntactic ellipsis (Holmberg 2012, Kramer & Rawlins 2009), anaphora (Krifka 2013), and both (Roelofsen & Farkas 2015). Krifka (2013) argues *yes* and *no* are propositional anaphors that require linguistic antecedents, similar to *that* and *so*. However, they are different in that they do not just refer to a proposition, they also either assert it (*yes*) or negate it (*no*), e.g. it is

not possible to say, *Yes surprised me*.[1] Krifka refers to the antecedents of polar particles as propositional discourse referents. A positive YNQ as in (1) only makes available one discourse referent corresponding to the positive response.

(1) Are you a friend of Jenny's?
     discourse referent: You are a friend of Jenny's.

    a. (i)   Yes. [meaning: I am a friend of Jenny's]
        (ii)   No. [meaning: I'm not a friend of Jenny's]
    b. (i) #Yes. [meaning: I'm not a friend of Jenny's]
        (ii) #No. [meaning: I am a friend of Jenny's]

The particle *yes* can only assert the positive discourse referent (as in (1-a-i)), and therefore cannot have the meaning in (1-b-i), while *no* can only negate the positive discourse referent (as in (1-a-ii)), and therefore cannot have the meaning in (1-b-ii). However, in responses to negative YNQs such as (2), polar particles seem to be interchangeable. Current work on English polar particles is largely concerned with accounting for this pattern.

(2) Are you not a friend of Jenny's?
     simplified LF: [$_{NegP}$ not [$_{TP}$ you are a friend of Jenny's]]

    a. *TP discourse referent*: You are a friend of Jenny's
        (i)   Yes. [meaning: I'm a friend of Jenny's]
        (ii)   No. [meaning: I'm not a friend of Jenny's]
    b. *NegP discourse referent*: You are not a friend of Jenny's
        (i)   Yes. [meaning: I'm not a friend of Jenny's]
        (ii)   No. [meaning: I'm a friend of Jenny's]

Krifka argues that negative YNQs make two discourse referents available, one anchored to the NegP, and the other to the embedded TP. In (2-a), *yes* asserts the TP discourse referent, and *no* negates it. In (2-b), *yes* asserts the NegP discourse referent, and *no* negates it. Since $\neg\neg p = p$, the meaning of (2-b-ii) is equivalent to the positive discourse referent anchored to the TP. Polar particles are indeed similar to propositional anaphors, which can also be anaphoric to embedded antecedents. In the following exchange, *that* could either convey that B didn't expect John to bring the matches or to not bring the matches.

(3) A: John didn't bring the matches.
     B: I didn't expect that.

The interchangeability of *yes* and *no* raises a question: Are bare polar particles ambiguous in response to negative YNQs? And if so, how do hearers figure out what they mean? Two

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[1] And yet we believe they can be embedded under predicates like *believe* (*I believe yes*) or conditionals (*if yes, ...*), although Krifka (2013) assumes they cannot be. This contrasts with the behavior of expressive exclamatives like *bullshit*, which in other ways are quite similar to polar particles: *# I believe bullshit/ # if bullshit, ...* An in depth exploration of this embedding behavior is beyond the scope of this paper.

claims have been made in the literature. First, Roelofsen & Farkas (2015) claim that bare particles are ambiguous, but they are more likely to be interpreted as negative in the absence of a following, positive sentence (e.g. *I'm a friend of Jenny's*). For Krifka (2013), a bare *no* is most naturally interpreted as a negative response, while a positive *no* response requires an overt clause.

Second, that a special intonation might be common or even required in positive responses to negative YNQs is widely noted in the literature. Krifka (2013, p. 13) claims that positive responses to negative questions require a "rejecting accent," though he doesn't describe what the accent sounds like. Roelofsen & Farkas (2015) claim that responses of the form *Yes/No, he did* bear obligatory contrastive stress on the auxiliary verb *did*. Pope (1972) identifies a rise-fall-rise tune across the entire utterance of *yes, he did* that we think is the contradiction contour, with a rise on *yes, he* and fall-rise on *did*. Cooper & Ginzburg (2011) report that to the extent that *no* is ambiguous in response to negative YNQs, positive responses will bear a distinct rise fall tune.

To recap, there are three empirical claims in the literature on how polar particles are used in responses to YNQs. We test these claims in the experiments reported below.

(4)   *Three empirical claims about polar particles*

   (i)   *yes* and *no* are interchangeable in response to negative YNQs, but not
           in response to positive YNQs.
   (ii)   Special intonation appears on positive *yes/no* responses to negative YNQs.
   (iii)   In response to negative YNQs, bare *yes* and *no* are unlikely to be interpreted
           as positive. Bare *no* is interpreted as negative (Krifka 2013).

3.   Contradiction Contour

We are particularly interested in the role that intonation plays in the interpretation of polar particles. The contour that we think is most relevant is a fall-rise tune that we identify as the contradiction contour (CC), so named by Liberman & Sag (1974). Liberman & Sag (pg. 421) write, "This contour is appropriate (although of course optional) just when the speaker is using the utterance that bears it to <u>contradict</u>—he may contradict what has just been said by another, he may contradict some assumption or implication of what has been said or done by another, or he may contradict himself." (5) exhibits a common use of the CC.[2] The image in (6) is a pitch track of B's utterance as produced by a participant.

(5)   A: You're not a friend of Jenny's.
        B: No (CC). I'm a friend of Jenny's (CC).

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[2]"(CC)" following an utterance indicates that the utterance bears a CC tune. There are two CCs in (5). Recordings of numbered examples where intonation is crucial can be found at http://prosodylab.org/output/goodhue-wagner-2015-examples/

(6)   *A visual representation of B's utterance in (5).*
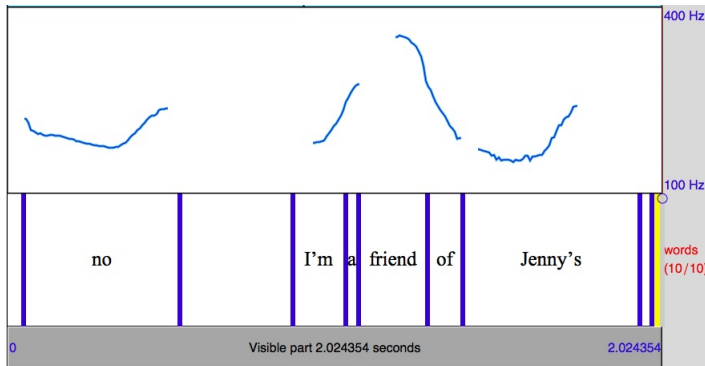
According to Ladd (1980), the CC is a high-falling tone, followed by a low-rise pitch accent on the nuclear or main stress of the sentence. We note that the initial rise is more reliably present when there is more material preceding the nuclear accent. This makes the CC hard to distinguish from other contours like the rise-fall-rise contour when sentence prominence is shifted to the initial position, as under subject-focus (cf. Ladd 1980).

Defining the notion of "contradict" in the quote from Liberman & Sag (1974) above is not trivial. If we were to define a contradiction as two assertions in a discourse that aim to add mutually exclusive propositions to the common ground, then we would not predict the use of the contradiction contour in responses to YNQs, e.g. in (7).

(7)   You are at a party and everyone is talking about Jenny. Jenny isn't at the party, but she has been your best friend for many years. Suddenly, everyone starts talking about the time Jenny dyed her hair pink. You have never seen her with pink hair, and you don't know if what they're saying is true or not. Everybody is laughing and joking about Jenny's pink hair when they notice that you don't recognize the story. Not realizing that Jenny and you are close friends, one person asks:
A: Are you not a friend of Jenny's? [A's expectation: you are not]
B: No (CC). I'm a friend of Jenny's (CC).

The apparent antecedent of the CC is not a prior assertion, but the information provided in the context, or perhaps the question, which may at best imply the negative response (cf. Trinh (2014) or Krifka (To Appear) for recent analyses of negative YNQs). A weaker notion of contradiction is needed. Liberman & Sag state the CC is licensed by contradictions of assumptions or implications, but they do not define these terms.

One possible analysis is that an utterance of p(CC) requires a propositional discourse referent anchored to $\neg p$, and thus involves a propositional anaphor similar to polar particles under Krifka's analysis. Analyses of intonational tunes involving propositional anaphors have been proposed in Bartels (1999) and Truckenbrodt (2007). But such an analysis would miss an important difference between polar particles and the CC. Consider (8):

(8)   [Like in (7), A has reason to suspect that B is not a friend of Jenny's, but the context leaves open whether or not B is in fact a friend of Jenny's.]

4

A: Are you a friend of Jenny's? [A's expectation: you are not]
B1: I'm a friend of Jenny's (CC)
B2: Yes, I am   B3: No, I'm not
B4: # Yes, I'm not   B5: # No, I am

The judgments in B2 through B5 are exactly as expected given Krifka's theory of polar particles: Since A asks a positive YNQ, only one discourse referent, *that B is a friend of Jenny's*, is available for *yes* and *no* to pick up (e.g. B2 and B3). Crucially, there is no negative discourse referent for the proposition *that B is not a friend of Jenny's*, hence B4 and B5 are unavailable. Note however, that using the CC on a positive response is perfectly acceptable here (e.g. B1). An analysis that posits a propositional anaphor as part of the meaning of the CC creates the following puzzle then: Why is a negative discourse referent available to the CC, but not the polar particles?

We will make use of the notion of *contextual evidence* introduced by Büring & Gunlogson (2000) for constraints on polar questions. We propose that the CC requires contextually salient evidence against the asserted proposition. We can model *evidence* as follows:[3]

(9)   *Evidence*: Evidence for p is a change in the context that increases the probability that p is true.

This notion of evidence can be motivated based on question-answer congruence. Suppose that questions denote sets of alternative propositions (Hamblin 1973). Then we can characterize a necessary condition on responses to questions as follows:[4]

(10)   *Question-Answer Congruence*: A response to a question has to be a discourse contribution that provides evidence for or against one or more of the propositions denoted by the question.

This condition on question-answer-congruence is broad enough to be compatible even with very indirect incomplete responses to a question, which seems desirable:[5]

(11)   A: Who will come to the reading group meeting today?
        B: Jane's mother is in town. ($\leadsto$ The information provided by this response combined with world knowledge about visiting mothers lowers our estimate of the likelihood that Jane will come to the meeting.)

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[3]Büring & Gunlogson (2000) do not discuss evidence in terms of probability. Such an approach might be couched within a Bayesian framework such as that outlined in Goodman & Lassiter (2014), but we will not explore the details of such an analysis here.

[4]See Groenendijk & Stokhof (1984) for a relevant discussion of QA-congruence based on the idea that questions denote partitions instead. Conditions on QA-congruence will hopefully follow from some more general pragmatic principle, which will have as a corollary the condition in (10).

[5]There may be additional constraints on QA-congruence that confines the range of possible responses further, but we note that the strong conditions often proposed to explain prosodic QA-congruence (e.g. Rooth 1992) are probably unnecessarily strict (cf. discussion in Wagner 2005).

Contextual evidence is further motivated by its use in Büring & Gunlogson (2000) and Trinh (2014) to state generalizations about the felicity of different types of questions:

(12)   a.   rising declaratives: Require contextual evidence *in favor* of *p*.
        b.   low negation YNQs: Require contextual evidence for $\neg p$.[6]

We use the notion of contextual evidence to formulate the meaning of the CC:[7]

(13) $[\![\text{CC}]\!]^c = \lambda p_{\langle s,t \rangle}$: There is contextually salient evidence against *p* in *C*. *p* [8]

The denotation in (13) treats the CC as a partial identity function. It is the tension between presupposing contextual evidence against *p* and being true iff *p* is true that creates the signal of disagreement that the CC is known for.[9] Both the CC on our analysis and polarity particles on Krifka's are dependent on previous context, but they differ in that polar particles require a discourse referent denoting a certain proposition, while the CC merely requires evidence for a certain proposition.

4. Production Experiment

Here we describe a production study that addresses two claims in table (4): (i) *yes* and *no* are interchangeable in response to negative YNQs, but not in response to positive YNQs. (ii) Special intonation appears on positive *yes/no* responses to negative YNQs.

4.1 Methods

Each trial involved a dialogue between a pre-recorded questioner and the participant, preceded by a silently read context story similar to the one in (7). We manipulated three factors: Whether the YNQ was positive or negative; whether the participant gave a positive or negative answer; and whether the participant used the polar particle *yes* or *no*.

    The manipulation of the answer polarity (*I am* vs. *I'm not*) required two different context stories. A story that sets up a positive answer (*I am a friend of Jenny's*) was illustrated in (7). The context in (14) exemplifies a set-up for a negative response:

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[6]Importantly, *evidence* and *bias* should not be confounded. High negation YNQs require a previous commitment to *p* (i.e. Romero & Han's 2004 positive bias), but they also seem to require evidence for $\neg p$.

[7]Cf. Portes & Reyle (2014) for a QUD account of French "implication" contour (IRF), which the authors claim primarily encodes a contradiction. N.b. that an English equivalent of Portes & Reyle's example (3) would be unacceptable with the CC, but acceptable with a contrastive accent. Therefore, IRF may be more similar to English contrastive accent than to the CC.

[8]One way to make explicit what 'contextually salient' means here would be to require a linguistic discourse referent that contributes evidence against *p*.

[9]As Ladd (1980) notes, the CC cannot be embedded. This suggests that the CC might actually be an operator over speech acts, similar to Wagner's (2012) proposal for the RFR contour. Another possibility is that the CC contributes a conventional implicature, as in the analysis of expressive meaning in Potts (2005).

(14)   You are at a party and everyone is talking about Jenny. Jenny isn't at the party, and you've never met her before. Suddenly, everyone starts talking about the time Jenny dyed her hair pink. You have never heard about this before, and you don't know if it's true or not. Everybody is laughing and joking about Jenny's pink hair when they notice that you don't recognize the story. Surprised that you don't seem to know who Jenny is, one person asks:
A: Are you not a friend of Jenny's? (A's expectation: you are not)
B: No ___ I'm not a friend of Jenny's

Both contexts were designed to make contextual evidence against the positive response (*I am*) salient. When a negative YNQ was used, it reinforced the contextual evidence, at least if our analysis of negative YNQs in (12-b) is correct.[10] There were eight context pairs total. Responses were always complete sentences, but we will refer to them as "(Yes/No) I am" and "(Yes/No) I'm not" for brevity. We instructed participants to pause at '___' to maximize unique intonations on polar particles themselves, and for later use in perception. Participants were not aware that the experiment was about intonation.

The three factors were crossed. Each participant saw each of the eight conditions for each item in eight randomly ordered blocks of trials with one condition from each item. If need be, this enables a latin-square analysis by looking at only the first quarter of trials.

After recording each trial, we asked for their naturalness judgment: "Please indicate how natural this response seems on a scale of 1 to 5 (1=least natural, and 5=most natural)." We ran 30 native speakers of North American English (mostly McGill undergraduates), but had to exclude 7 because of script errors, making for 1,472 observations total.

4.2   Results: Naturalness

First let's examine participants' naturalness ratings of the responses they were asked to say.

(15)   *Naturalness ratings for responses, for positive and negative questions*

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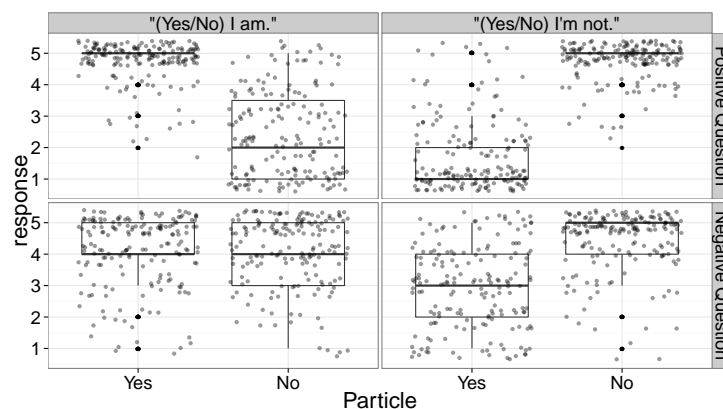
[10]A NELS reviewer notes "...that in recent work [Trinh (2014)] has argued that positive polar questions are incongruent with contextual evidence towards not-phi." While Trinh's examples seem to support this claim, our experimental contexts do not. Further work on the licensing conditions of positive YNQs is needed.

The top row of the plot in (15) shows how participants rated *yes/no* responses to positive YNQs. As expected, when indicating a positive response to a positive YNQ, *yes* is rated as highly natural and *no* is rated as unnatural, and vice-versa in negative responses. *yes* and *no* are therefore indeed not interchangeable, although *No, I am* is rated as somewhat more natural than *Yes, I'm not*.

The bottom row shows how participants rated responses to negative YNQs. As suggested in empirical claim (i) from (4), we observe that both *yes* and *no* are overall acceptable in both positive and negative responses, indicating a high degree of interchangeability of the particles when used in response to negative questions. We fitted a cumulative link mixed model regression for this subset of data, with random intercepts and slopes for participant and item. We found a significant main effect of ANSWER ($p<0.001$), a significant main effect of PARTICLE ($p<0.001$), and a significant interaction ($p<0.001$).

The interaction is due to the fact that in positive answers, both *yes* and *no* are equally acceptable, while in negative answers, *yes* is rated as significantly less natural than *no*, replicating the pattern for polar particle responses to negative rising declaratives found in Goodhue et al. (2013), which reports on a separate experiment.

The small main effect of answer polarity might be due to a preference for agreements with the negative evidence of negative YNQs, as argued by Krifka (2013). A previous corpus study (Cooper & Ginzburg 2011) provides support by showing that 54% of answers to negative YNQs have negative polarity, while 23% have positive polarity.

4.3 Results: Intonation

The recorded responses were annotated for intonational contour by an RA. A contour can appear on *yes* and *no* themselves, on the sentence following them, or across both. We therefore annotated contours on polar particles and their following sentences separately, using three intonational categories (declarative fall, contradiction contour (CC), and rise fall). Intonations were marked "unclear/other" if it did not fit any of these categories, and "problematic" in case of disfluencies, recording errors, etc. Polar particles were marked as "none" when the participant produced a single contour over the whole utterance.

We believe the "rise fall" category reflects the intonation mentioned by Cooper & Ginzburg (2011), and may also relate to what Roelofsen & Farkas's (2015) call "stress," though from personal correspondence, loudness (intensity), and not intonation, may be the defining characteristic. We will not discuss rise fall further here due to its rare use and even distribution across conditions. Counts and percentages are summarized in table (16).[11]

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[11]A category for question rises was included in the annotation, but was only used 3 times total. Question rise and rise fall annotations are included in the "unclear/problematic" row of table (16).

(16) *Annotation counts and percentages*

Contour	*n* contours on particles	*n* contours on sentences
Declarative Fall	1137 (77%)	1022 (69%)
Contradiction Contour (CC)	150 (10%)	241 (16%)
Unclear/Other	23 (2%)	140 (10%)
None	98 (7%)	n/a
Problematic	64 (4%)	69 (5%)

A first observation based on the overall distribution summarized in (16) is that the contour used most often when speakers didn't use the declarative contour was the contradiction contour. This suggests that the CC is indeed the most important intonational tune other than the declarative tune in responses to polar questions. Plot (17) shows intonations produced by participants in response to negative YNQs depending on the particle used, and whether the answer sentence was positive or negative:

(17) *Negative YNQ: "Are you not a friend of Jenny's?"*
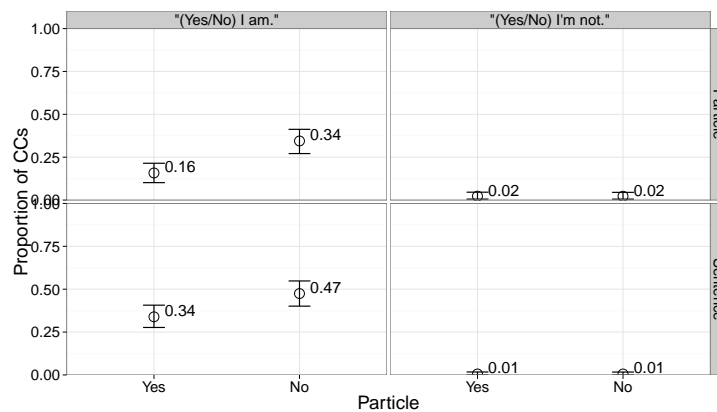
We fitted a logistic regression mixed model, with random intercepts and slopes for participant and item. We found that there is a significant effect of answer polarity in that a special intonation appears exclusively on positive *yes* and *no* responses to negative YNQs and their following sentences ($p<0.001$). Therefore, empirical claim (ii) from (4) is confirmed: special intonation, the CC, appears on positive *yes*/*no* responses to negative YNQs, replicating a similar finding for responses to negative rising declaratives in Goodhue et al. (2013).

We also found a significant effect of particle: the CC was more likely on *no* particles and their following sentences ($p<0.006$). One possible explanation is that *no* is more likely to be used in disagreements than *yes*, and therefore is more likely to appear with the CC. However, Goodhue et al. (2013) did not find the choice of particle to matter in responses to uninverted negative rising declaratives. It is possible that this effect is related to inversion, although we do not know why it would have this effect.

The results from the negative YNQ context in this experiment and Goodhue et al. (2013) could be taken to show that the CC requires a linguistic antecedent proposition with opposite polarity, or merely contextual evidence for that proposition. The results from

positive YNQ contexts support the latter conclusion (see plot (18)). We found that there is a significant effect of answer polarity in that a special intonation, the CC, appears exclusively on positive *yes/no* responses to positive YNQs and their following sentences (*p*<0.001). The evidence for the negative answer provided by the context sufficed to license the CC, even if at a lower rater that in response to negative YNQs.

(18)   *Positive YNQ: "Are you a friend of Jenny's?"*
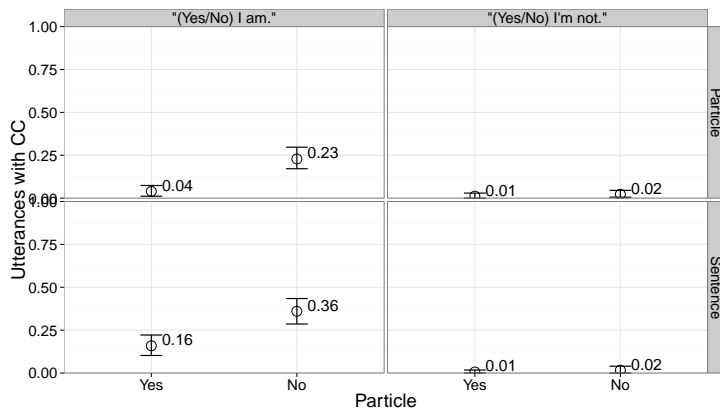
5.   Perception Experiment

Remember claim (iii) from table (4): Bare polar particles used in responses to negative YNQs most likely convey a negative response (Roelofsen & Farkas 2015), and bare *no* unambiguously conveys a negative response (Krifka 2013). Given our finding that *yes* and *no* themselves carry the CC, we wondered whether its presence affects a listener's interpretation. Here is a sketch of how the CC might affect the interpretation of a bare particle: In response to "Are you not a friend of Jenny's?" a polar particle can either convey a positive (*I am*) or negative (*I'm not*) response, since the negative YNQ makes both the negative and the positive discourse referent available, so in principle the response should be ambiguous. Intonation can give a clue to interpretation, however: If the particle bears the CC, the speaker conveys that the response disagrees with some contextually salient evidence. The negative question requires that there is contextually salient evidence in favor of the negative response. If the CC signals disagreement with that, the particle must indicate the positive response. Failing to use the CC in a context in which there is negative evidence, however, might lead a listener to conclude that the speaker does not disagree with the evidence and lead to a negative interpretation. We conducted a perception experiment to test whether the interpretation of bare polar particles was indeed affected by intonation in this way.

5.1   Methods

Participants were presented with a context story on a computer screen. The experiment's contexts were similar to those in the production experiments, except that now they crucially leave open whether the character will give a positive or negative response:

10

(19)   **Context**: Some people at a party are talking about Jenny, who isn't there. Someone brings up the time Jenny died her hair pink and a bunch of people are laughing, but not Pat. John notices Pat isn't laughing. John and Pat don't really know each other. The following dialogue ensues:
John [Heard through headphones]: Are you not a friend of Jenny's?
Pat [Heard through headphones]: Yes

The question recordings were the same as in the production experiment. The responses were extracted from the recordings of the production experiment. These responses varied along three dimensions: (i) particle: whether the word uttered is *yes* or *no*. (ii) intonation: whether the intonation used was the CC or declarative. (iii) origin: whether the polar particle answer came from a trial in the production study in which the participant said a negative sentence or a positive sentence. On each trial, participants could first silently read the context and the dialogue, and then pressed a key to hear the dialogue via their headphones. Afterwards, the participants were asked how they interpreted the response:

(20)   **Question**: Based on Pat's response, which of the following is true:
1. Pat is a friend of Jenny's.   2. Pat is not a friend of Jenny's.

The participants were 25 North American English speakers, mostly undergraduate students. There were eight different dialogues (items), and the experiment was run so that each participant saw all conditions in all items, therefore 1,536 observations total.[12] The trials were randomized so that participants never saw the same condition twice in a row, and trials from the same item were organized into different blocks to maximize their distance, and to allow for a latin-square analysis of a subset of the trials, as in the production study.[13]

5.2   Results and Discussion

The results are summarized in the following figure (21). We fitted a logistic mixed effects regression, which included particle, intonation, origin, and two-way interactions between origin and the other predictors as fixed effects, and random effects for participant and item that included as many predictors as possible for the model to converge.[14]

We found a significant effect of intonation. Particles bearing the CC were significantly more likely to be interpreted as a positive sentence (*I am a friend of Jenny's*: 26% for Dec, 65% for CC, $p<0.001$). This is evidence against claim (4-iii), that in order to convey a positive response to negative YNQs, *no* must be followed by an overt sentence.

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[12]One participant was removed for completing less than 50% of trials, and 10 observations total were removed due to participants choosing neither possible answer.

[13]In neither study did we find any qualitative difference between looking at all trials or only looking at the first block in which participants only saw one condition from each item.

[14]We did not include an interaction between particle and intonation because it is clear from exploratory data analysis that there is no interaction effect.

(21)   *Interpretation of* yes/no *response to: "Are you not a friend of Jenny's?"*
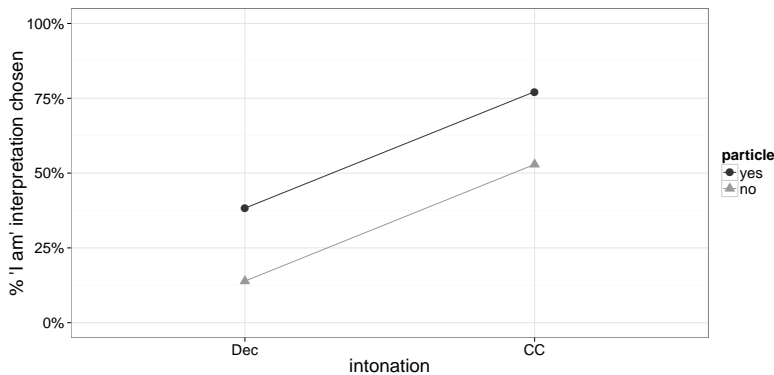
Given our proposed meaning for the CC, one could ask why positive interpretations are not at 100% when the CC used. But note that using the CC on a negative response to a negative question is possible in principle, if there is also positive contextual evidence (in addition to the negative evidence necessary to license the negative question). This was just not the case in our production study, which is why we found almost no negative responses with the CC. The contexts in our perception experiment may have been open enough to leave some room for listeners to posit that there may have been such evidence. Sometimes, even raising a question of the form *not p?* can suggest that the speaker considers there to be some evidence for *p* (in addition for *not p*), and license the CC on a negative response. The following question (adapted from examples by Trinh) both suggests contextual evidence that B is not left-handed (antecedent for CC in B1), and given the lower odds of being left-handed the formulation of the question suggests a prior belief of A that B is left-handed, which B can take as positive evidence (antecedent for CC in B2):

(22)   A always thought B was left-handed, but now sees B writing with her right hand.
       A: Are you not left-handed?
       B1: I'm left-handed (CC).   B2: I'm not left-handed (CC).

There was also an effect of the choice of particle: *yes*-responses were significantly more likely to be interpreted as conveying a positive sentence (*I am a friend of Jenny's*: 30% for *no*, 53% for *yes*, $p<0.001$). This is expected if both *yes* and *no* prefer picking up the inner, positive discourse referent, resulting in a positive response for *yes* and a negative response for *no*. Such a preference has been noted by Krifka, who formulates the pragmatic constraint *NegDR: being anaphoric to a negative discourse referent is dispreferred.

But if the inner antecedent is preferred, why is *yes* with declarative intonation interpreted as positive in under 50% of observations? This can be explained if there is a preference to use the CC whenever possible. Failing to use the CC in a context where there is negative evidence (such as in response to negative YNQs) then licenses the inference that

12

the speaker must agree with the negative evidence. The absence of the CC is a cue in favor of the outer antecedent.[15]

Kramer & Rawlins (2012) report results from a written truth-value judgment study on the interpretation of bare polar particles that diverge from ours. They found that when trying to convey a positive response (*I am*), bare *yes* is mostly judged false, while *no* is judged more ambivalently. In our experiment, *yes* was more likely than *no* to be interpreted as conveying a positive response. The discrepancy might be due to the fact that Kramer & Rawlins did not control for intonation. Our participants were more likely to produce the CC on *no* than on *yes* (Experiment 1), and bare particles carrying the CC are more likely to be interpreted as positive (Experiment 2). It is plausible then that Kramer & Rawlins's participants imagined more *no*-responses with the CC, leading to more positive interpretations.

6.   Conclusion

In this paper, we have provided experimental evidence that (i) polar particles *yes* and *no* are interchangeable in response to negative YNQs but not in response to positive YNQs, (ii) that there is a special intonation, the CC, that appears on positive responses that disagree with negative contextual evidence, and (iii) that bare polar particles responding to negative YNQs are not necessarily likely to convey a negative response, contrary to earlier claims in the literature. Instead interpretation is impacted by the contour present on the particle.

Our experiment has several limitations. Most obviously, we only used contexts which convey negative contextual evidence. We did not vary evidence in order to keep the complexity of the experiment under control, but we plan to address this in a follow-up study.

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[15]It could be that this inference by the listeners is an artifact of our experiment, since utterances with and without the CC were juxtaposed across trials—in a more natural situation, this effect might be smaller.

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